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Stéphane Poussineau, Michel Pichavant, Jean-Louis Bourdier. The zone 1440 AD eruption of the soufriere of Guadeloupe (Lesser Antilles) : an experimental determination of the pre-eruptive consitions of the andesitic magma body.. Geophysical Research Abstracts, 2004, Nice, France. hal-00078539

**HAL Id: hal-00078539**

**<https://hal-insu.archives-ouvertes.fr/hal-00078539>**

Submitted on 14 Jun 2006

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## **THE ZONED 1440 AD ERUPTION OF THE SOUFRIERE OF GUADELOUPE (LESSER ANTILLES): AN EXPERIMENTAL DETERMINATION OF THE PRE-ERUPTIVE CONDITIONS OF THE ANDESITIC MAGMA BODY**

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The 1440 AD eruption of the Soufriere of Guadeloupe (Lesser Antilles arc) is characterized by a dramatic change of the chemical composition of erupted products, from andesitic (clear pumices, 61-62 wt% SiO<sub>2</sub>) to basaltic andesite (dark scoria, 55-56 wt% SiO<sub>2</sub>). This compositional sequence is interpreted to reflect the tapping of a silicic magma body remobilised following the arrival of a mafic magma batch. The conditions of equilibrium (T, P, fO<sub>2</sub>, melt H<sub>2</sub>O content) within the andesite body prior to the mixing event were determined from a coupled mineralogical/petrological and experimental approach.

The andesitic pumices comprise plagioclase, orthopyroxene, clinopyroxene, magnetite and rare ilmenite phenocrysts. Plagioclase shows complex oscillatory zoning (An<sub>55-75</sub>), with rim compositions close to An<sub>65</sub>. Orthopyroxene (En<sub>55-60</sub>) and magnetite (Mt<sub>65-70</sub>) are weakly zoned. Glass inclusions trapped in plagioclase and orthopyroxene are rhyolitic (72 wt% SiO<sub>2</sub>). They show small variations in water contents from 4.5 to 5.5 wt%, as determined with the by-difference technique and from near-infrared spectroscopy. Pairs of coexisting Fe-Ti oxides yield equilibrium temperatures ranging between 800°C and 950°C for DNNO values between +0.4 and +1 (calculations at 2 kbar).

A sample representative of the andesitic body (61 wt% SiO<sub>2</sub>) was selected for the experiments. All were performed in an internally heated pressure vessel equipped with a fast quench apparatus, at T between 800 and 950°C, P between 1 and 2 kbars,

$f_{O_2}$  from DNNO-1 to DNNO+2, and for both water saturated and undersaturated conditions, using H<sub>2</sub>O-CO<sub>2</sub> mixtures. Comparison between experimental and natural phase assemblage and chemical compositions allows the equilibrium conditions of the andesitic body to be specified, i.e. 875-900°C, 1.5  $\pm$  0.25 kbar, DNNO = +0.5 to +1 and melt H<sub>2</sub>O content between 4.5 to 5 wt%.